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The past year has seen an industry struggling to make headway against tight budgets and over-capacity. But for some it has not all been doom and gloom, as the year looks set to close on an industry in better spirits than it has been for several years.

The year of very mixed fortunes

Of course, there is insufficient room in this overview to do justice to all that has happened in the ever-diversifying business that is III-Vs. The year has seen some impressive progress in the commercialisation of advanced technology. New markets are opening up and designers are being supplied with the materials and devices to innovate exciting new systems level products and improve existing ones. For example, in two key areas of wide bandgap semiconductors: 2003 saw more than one company announcing commercial availability of genuine GaN substrates and SiC foundry services. The former should increase prospects for broader take up of, for example, violet lasers, while the latter offer improved performance RFICs.

Legal battles

Nevertheless, in a business where the stakes are so high, 2003 brought some of the harshest legal battles in our history. These involved just about all of the major players, including of course Nichia. Cree had its own problems, issuing lawsuits for patent infringements and being subject to various litigious actions. But these were all resolved and the company continues to make good headway in its LED business, which is now complemented by a thriving RF electronics foundry. However, these battles should not be seen as over; the agreements have, as it were, been struck between members of the 'older guard,' whereas issues remain with the 'younger guns' in Taiwan and elsewhere.

Superficially much remains the same, but all too often companies have been forced into drastic measures for survival. As a result, the industry has begun to see the forecasted consolidation of its members. The shrinkage covers just about all levels of the industry, meaning that even though III-Vs might still have great potential revenues, its value as an employer might be shrinking.

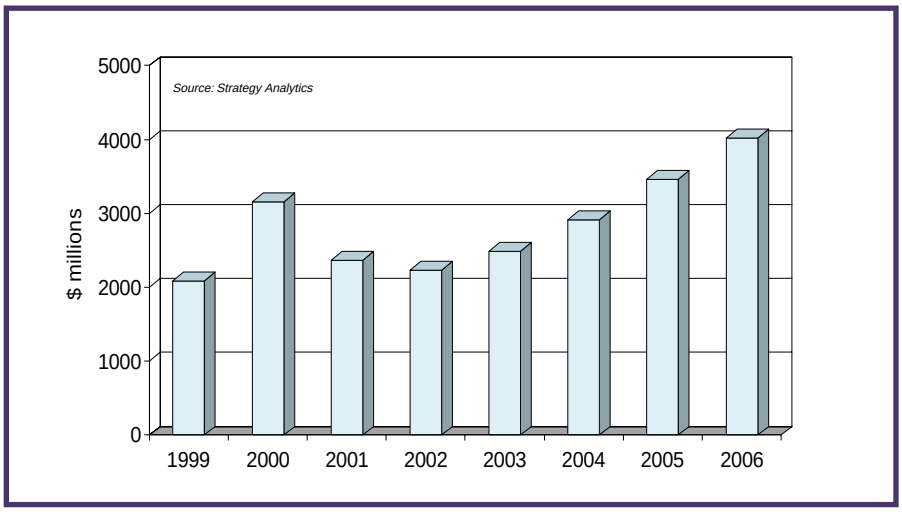
Start-ups and slimmers

Consolidation is the inevitable fate of any industry sector. This has been especially true for the semiconductor opto components sector, which has had so many start-ups. But it has affected everyone, from the largest to the smallest. The past year or so saw some very big names slimming down their commitment to components, in preference for systems level business. As a result, the merchant component operators have been assuming an ever larger responsibility as regards not only manufacturing but also in the generation of IP. A worrying trend for western and Japanese companies has been the trend for SE Asian companies not to settle for nuts and bolts manufacturing, with determined moves to add design and innovation. This is likely to include China too, of course. A good pointer to this trend is China's Huawei Technologies, announcing plans to enter the highly competitive global handset market with new product next year.

At the source materials base of the III-Vs business pyramid there is little to report, even though it would appear there are still too many substrate companies chasing a diminishing end-user market.

Equipment shrink

The equipment industry has, however, seen more mergers than in recent years. Emcore is an example, transforming from an epi vendor to a merchant provider of materials and devices. AXT went back into substrates. ATMI had exited the GaAs business, but is moving strongly into SiGe.



Strategy Analytics sees recovery from the GaAs devices market reaching $4bn by 2006.

Aixtron remains true to epitaxial equipment, but has like others diversified into silicon materials process equipment. Such trends are not confined to MOCVD, with MBE having changed considerably - VG Semicon has moved to a new owner, Oxford Instruments. Shortly after that deal, Siemens said it would acquire the remaining 49% of Oxford Magnet Technology from Oxford Instruments. Veeco has turned back the clock - it has been a long time since the industry could boast a supplier with MOCVD and MBE skills under one roof. It had earlier acquired Applied Epi, and has now added Emcore's MOCVD lines.

Picogiga pioneered the MBE merchant epiwafer business, but has struggled lately. In 2003 it found a new home with SOITEC. The slew of competitors which arrived since Picogiga's launch must be wondering how many of them will survive to see the next market upturn. Perhaps the French company was overly reliant on epiwafers. IQE was another pioneer and has since diversified, adding MBE and now silicon materials too. Kopin is still strong in epiwafers, alongside its successful displays business. But it too has diversified into the nitride device market.

Drastic remedies

The telecoms market went from inflation to depression. To stay in the business, players have had to take some unpleasant action. It was surprising to see so many former Top Five component suppliers dumping manufacturing, seeing no future for themselves in making components and preferring to outsource.

It was either that or move your manufacturing to the Far East. For example, in July Agilent began closing its fiber-optic component fab in Ipswich, UK, in favour of Singapore. It has kept some employees to continue in R&D and marketing. Meanwhile, the bulk of JDS Uniphase's manufacturing is now in China.

Elsewhere, some veterans were exiting the III-Vs industry: Vitesse sold its line of optical module products to Avanex Corp and closed its 6-inch GaAs facility in Colorado Springs. It has not forsaken III-Vs entirely though, and now has a strong InP device foundry to add to its otherwise CMOS business. Some silicon companies were moving in the other direction. In September, one of the world's leading manufacturers of semiconductor devices, STMicroelectronics announced its commitment to light-emitting silicon technology for optocoupler devices.

Obituary:

The following company names were amongst the casualties in 2003.

January - Sterling Semiconductor acquired by Dow Corning.

February - Bandwidth9 - VCSELs for DWDM.

March - OMM - MEMS-based all-optical switching components.

April - Network Photonics - MEMS-based wavelength switch for DWDM optical transport networks.

May - Essient Photonics - 10 and 40 Gbit/s ultra-low-power optical modulators.

May - Onix Microsystems - MEMS-based photonic-switches.

July - ThreeFive Photonics - chip based optoelectronic integration.

August - Terahertz Photonics - optical waveguide devices.

September - Celeritek exits handset PA business.

September - Optovation - optical performance monitoring.

October - AXT opto business.

November - Emcore sells TurboDisc MOCVD business to Veeco.

N.B. Not all of these names may be lost forever as some were in abeyance awaiting a decision as to the final outcome

Opto-analog merger

Another key aspect of 2003 was the bringing together of opto and analog under the one company. This involved some vertical integration too. It also frequently involved an RF company acquiring opto skills, but sometimes followed the Bookham model of an opto start-up moving into RF as well. For example, in the summer GCS Inc, which is well known as a pure-play III-V wafer foundry, expanded its foundry services into QWIP detectors and VCSELs, etc. on 4-inch wafers. Earlier, Oepic began offering its advanced optoelectronic GaAs and InP wafer processing services to optical and electronics companies, for product development and low to medium volume production. The aim of these developments seems to be to offer customers a 'one-stop' source for their production requirements.

ThreeFive Photonics BV linked up with ASIP Inc, under a new name, with ThreeFive Photonics BV operating in The Netherlands as a wholly-owned subsidiary. The directors have promised that the new company will be 'well positioned to lead across a much broader set of product and market segments.'

Cree diversified still further with its first packaged LED product offerings. The Xlamp represents a value-added development on top of its core business of producing GaN-on-SiC LED die, which are usually packaged by customers. It is now better aligned, with the competition in blue and white LEDs, notably Lumileds and Osram Opto Semiconductors.

Interestingly, this came not long after Osram Opto Semiconductors signed up for the purchase of at least 500m LED chips over Cree's entire opto product line, including LED chips and SiC wafers. Osram's commitment to opto was one of the highlights at a gloomy time. In April, it opened what it described as 'the world's most advanced optoelectronics chip factory' in Regensburg.

Wolf-Dieter Bopst, president of Osram, says: "This will give us the platform to

become number one [in optoelectronic semiconductors] in the medium term in this dynamic growth market."

Fellow German company, Aixtron AG reported lower figures, but says it has 'received some encouraging signals from the market during Q3', cautioning that it thought it still too early to talk of a sustained recovery. Many customers remain cautious, regardless of the positive general economic data, it said.

Still the star of the MMIC handset market, RF Micro Devices rewarded investors with record sales in its recent quarter - a 36.5% increase on the equivalent period last year. RFMD said it had enjoyed better sales in the buoyant handset market, coupled with manufacturing efficiencies as it transitioned from 4- to 6-inch wafer processing. Sadly, one of its principal competitors in the RF PA module sector, Skyworks, was unable to sustain momentum and reported essentially flat revenues for the past quarter.

Now an RFIC and fibre optic component manufacturer, TriQuint Semiconductor saw better fortunes with revenue, gross margin and earnings per share all above company guidance, due to a very strong September, it said. For others too, wireless was being a lifesaver. Its total unit shipments were up by nearly a third in the September quarter.

Anadigics acquired the wireless handset PA subsidiary of Celeritek, Tavanza, adding to its CDMA product line and increasing penetration of the handset OEM business. Fabless PA designer Tavanaza had only been with Celeritek for a year. Furthermore, a change in purchasing strategy by Motorola hurt Celeritek so badly in September, it later said it would be exiting the handset PA MMIC business, opting for defence and standard GaAs parts.

While these were special circumstances for the company, it confirmed that things are still not altogether on course for recovery for GaAs RF products. One considerable worry must come from the directions that IBM is moving in. IBM is assembling some pretty capable foundry technologies for RF and wireless. There is no GaAs here, rather the company (and others) are tuning up their BiCMOS silicon for the receiver side as well as lower power RF, such as Bluetooth and Wi-Fi. It also has its eye on supplying foundry services for datacoms and even automotive. In an interesting technical development, it recently demonstrated excellent results using its SiGe-on-SOI for digital and analog.

In October came the not too surprising announcement that Motorola would separate its Semiconductor Products Sector operations into a publicly traded company. This is in keeping with its plans to focus on communications and integrated electronic systems. What did suprise some was Fairchild Semiconductor acquiring the commercial unit of Raytheon's RF components division. It will make Fairchild's one of the broader catalogues in the business, combining GaAs MMICs with a range of optoelectronic devices, including LEDs.

The year unfolds

As the year got underway, Dow Corning acquired Sterling Semiconductor. Also in January, Emcore continued the countdown to becoming a materials and devices company by acquiring Agere's opto business, as Ericsson sold off its opto business. A month later, OCP acquired Gore's optical module business, then in March NeoPhotonics Corp, the developer of nanomaterials-based photonics technologies and products, purchased Lightwave Microsystems, which is known for its standard and optical communication system ICs. In the same month Mitsubishi formed a new compound semiconductor division and Finisar acquired Genoa.

In April came news that Sumitomo Chemical would buy the ATMI GaAs epi business, and Soitec would acquire various epi-related assets of Picogiga.

May brought news of more casualties, such as Onix Microsystems Inc, but in an interesting turn of events Spire bought back Bandwidth Semiconductor. Avanex bought Alcatel Optronics and parts of Corning's opto business. Then in June Vitesse acquired Multilink Technology, while Metro-Optix Inc, which started as an LM Ericsson spinoff, closed its doors.

Opto Speed (Zurich) AG, the developer of photodiodes and superluminescent LEDs also closed its doors in July. That month Cree bought ABB's SiC IP portfolio. August saw DMG Technologies acquire Demeter from Finisar and Memscap SA buy optical components startup GalayOr Networks.

The M&A activity continued unabated into September, with Optovation Inc, the optical performance monitoring startup, throwing in the towel. Bookham's roster of acquisitions took another step with Ignis Optics, and sadly Corning's IntelliSense division closed down. IXYS acquired GaAs RFIC maker Microwave Technology, one of several such moves in this segment during the year. Following shortly after was Fairchild's acquisition of Raytheon RF Components, while RFMD completed its acquisition of Resonext.

October followed with more moves in the equipment sector, as Thermo VG Semicon was acquired by Oxford Instruments and Emcore acquired the 10G Ethernet transceiver business of Molex. Then in November, Emcore sold its TurboDisc MOCVD business to Veeco. Also Alliance Fiber Optic Products Inc acquired Ritek Corporation's Photonics Division in Hsin Chu Industrial Park, Taiwan. And Oplink Communications Inc acquired RedClover Networks Inc.

2004 beckons

Any review has to look ahead and hopefully offer some encouragement for the players who have weathered the trials of 2003 and earlier. The heady days of the telecom boom are a distant memory, but lessons were learned as the industry struggled to survive. The new-found, hard-won maturity of the III-Vs industry should bring with it the more predictable cycle of business shown by silicon. That is no consolation to some, but it will have to be embraced so that once again III-Vs can learn from the mainstream and become fit and ready for the better days which many are forecasting for 2004.